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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/554,637	10/27/2005	Min-Hyo Seo	1599-0293PUS1	9196

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BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER	
ROGERS, JAMES WILLIAM	

ART UNIT	PAPER NUMBER
1618	

NOTIFICATION DATE	DELIVERY MODE
09/24/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/554,637	SEO ET AL.	
	Examiner	Art Unit	
	JAMES W. ROGERS	1618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 August 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5 and 7-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-5 and 7-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Applicants amendments to the claims filed 08/03/2010 have been entered.

Response to Arguments

Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1,3-4,7-8 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Journal of Polymer Science: Part A: Polymer Chemistry, Vol 39, 973-985 (2001), cited previously) in view of Seo et al (WO 03/033593), cited previously.

Lee discloses the synthesis of end group functionalized polylactides (PLA), the polylactides could be multi-armed, star type polymers. See entire disclosure especially scheme 1 and figure 1. The multi-arm PLA polymers comprised a core made from pentaerythritol and terminal carboxylic acid functional groups produced from succinic anhydride. Lee made the multiarm PLA by reacting lactide with pentaerythritol, a claimed initiator, dissolving the polymer with chloroform and precipitating the polymer with methanol and reacting the branched polymer formed with succinic anhydride. Lee showed experimentally that end groups can have an effect on the degradation rate of PLA polymers and this effect was shown to be additive for multiarm polymers that contained more functionalized end groups than their linear counterparts. Thus it was

shown that 4 arm carboxylic acid terminally functionalized PLA degraded at a higher rate over time than 3 arm or linear equivalent PLA macromolecules.

While Lee discloses the same type of multi-arm copolymers claimed and disclosing that PLA was useful in drug delivery systems is silent on the use of such multi-arm PLA polymers in micelle compositions. Lee is further silent in respect to claim 7 part 2 that requires precipitating the polymer from a water miscible solvent by adding an aqueous solution and Lee is silent on the additional step of forming a salt of the carboxylic acid end group by adding an alkali salt.

Seo is disclosed in previous office actions filed 04/17/2009, 11/06/2009 and 05/03/2010. Seo is used primarily for the disclosure within that carboxylic acid functionalized PLA polymers could form micelles and solubilize poorly water soluble drugs. Seo also describes the technique of precipitating PLA polymer using water and forming a carboxy alkali metal salt by addition of an alkali salt, sodium bicarbonate (sodium hydrogen carbonate). See examples within. Thus the claimed technique of precipitating the PLA polymer and forming terminal carboxy alkali metal groups would have been prima facie obvious to one of ordinary skill in the art because the techniques were part of the ordinary capabilities of a person of ordinary skill in the art as describe by Seo. The reason to use water instead of methanol to precipitate a polymer would obviously be that water is more biologically benign (less toxic) than methanol and is a "greener" solvent (less processing to make and dispose of). The reason to modify the carboxy terminuses into their corresponding salt is simply to increase the polarity at the termini of the polymer and therefore also increasing the polymers solubility in water.

Since the polymers of Lee and Seo are structurally similar, in that the polymers are polylactic acid functionalized with carboxylic acid end groups, one of ordinary skill in the art would have a high expectation of success in forming micelles from the multiarm PLA polymers disclosed in Lee. One of ordinary skill in the art would have good reason to pursue known techniques in the art for using the functionalized star-like PLA of Lee in drug type of formulations since the reference describes PLA as useful in drug delivery applications but is silent on specific types of formulations; one such specific formulation is described by Seo. The reason to make a micelle from the end functionalized PLA polymer of Lee would be that the micelle would have the desirable biodegradability of PLA which degrades into non-toxic lactic acid and the micelle would be capable of delivering poorly water soluble drugs to a subject in need. As disclosed in Lee 4-arm PLA degraded at a faster rate than 3 arm or 2 arm, thus one of ordinary skill in the art could advantageously adjust the degradation rate of the drug delivery device by simply selecting a PLA macromolecule containing the number of polymeric arms that yields the most desirable degradation rate.

Neither reference above discloses a molecular weight for the multiarm macromolecule that is within applicants claimed range. However adjusting the molecular weight in this polymer is clearly a result effective parameter that a person of ordinary skill in the art would routinely optimize. Optimization of parameters is a routine practice that would be obvious for a person of ordinary skill in the art to employ. It would have been customary for an artisan of ordinary skill to determine the optimal molecular weight for the branched polylactide to achieve the desired results. For instance, the

introduction section of Lee describes how PLA may be used in biomedical applications where it may be necessary to adjust the degradation rate of the polymer by adjusting several parameters including the molecular weight of the polymer. Thus, absent some demonstration of unexpected results from the claimed parameters, the optimization of molecular weight would have been obvious at the time of applicant's invention. It is well-established that merely selecting proportions and ranges is not patentable absent a showing of criticality. *In re Becket,* 33 USPQ 33; *In re Russell,* 169 USPQ 426. The examiner further notes that the secondary reference discloses that the linear PLA polymers disclosed have a MW range of 500-2,000 Da, a four arm macromolecule made from these polymers would have a MW of ~2,000-8,000 Da, within applicants claimed range. Thus form the combination of references above the limitation would also have been prima fascia obvious to one of ordinary skill in the art.

Claims are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Journal of Polymer Science: Part A: Polymer Chemistry, Vol 39, 973-985 (2001) in view of Seo et al (WO 03/033593), in view Sodergard (US 2004/0091573, cited previously).

Lee and Seo are disclosed above, along with the reasoning for why the combination would be obvious. Lee does not disclose the specific polyol cores claimed in dependent claims 5 and 9.

Sodergard discloses multiarm polymers containing a core molecule including maltitol along with numerous other naturally occurring polyfunctional compounds of

sugars and tri-saccharides and polymer arms containing units derived from lactic and glycolic acid. See [0006]-[0016]. Thus Sodergard is used primarily for the disclosure within that applicants claimed saccharide cores were well known at the time of the invention to be used as polyol cores in PLA multi-arm polymers.

Since Sodergard discloses the use of PLA in the multi-arm polymers described one of ordinary skill in the art would have a high expectation of success in adding the core molecules of Sodergard and reacting them with the PLA polymers of Lee and Seo. The reason to make such a modification to Lee is provided by the disclosure within the reference, which as noted above, disclosed that PLA macromolecules with higher successive polymeric arms had higher biodegradation rates. Thus a polyol core with more arms (maltitol has 9 reactive hydroxy groups) would be expected to have a quicker degradation rate than a 4 or 3 arm or linear PLA. Thus one of ordinary skill in the art could advantageously adjust the degradation rate of a drug delivery device by selection of core material that produced a PLA macromolecule with a number of polymeric arms that yielded the most desirable degradation rate. Thus the claimed invention would have been *prima facie* obvious since all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Alternatively to the reasoning above the examiner notes that Sodergard discloses core molecules could include pentaerythritol and disaccharides such as maltitol. Thus

pentaerythritol and maltitol are well known core molecules used in making branched polymers and either molecule can be considered as equivalent for the other. An obviousness rejection based on similarity in chemical structure and function entails the reason for one of ordinary skill in the art to make a claimed compound, in the expectation that compounds similar in structure will have similar properties.

Conclusion

No claims are allowed. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James W. Rogers, Ph.D. whose telephone number is (571) 272-7838. The examiner can normally be reached on 9:30-6:00, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Hartley can be reached on (571) 272-0616. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/J. W. R./

Examiner, Art Unit 1618

/Michael G. Hartley/

Supervisory Patent Examiner, Art Unit 1618